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Priority Document

PATENT  
1817-0118P

#4

IN THE U.S. PATENT AND TRADEMARK OFFICE

Applicant: Eanna TIMONEY et al. Conf.: 1540  
Appl. No.: 10/071,079 Group:  
Filed: February 11, 2002 Examiner:  
For: A VEHICLE SUSPENSION SYSTEM

L E T T E R

Assistant Commissioner for Patents  
Washington, DC 20231

April 1, 2002

Sir:

Under the provisions of 35 U.S.C. § 119 and 37 C.F.R. § 1.55(a), the applicant(s) hereby claim(s) the right of priority based on the following application(s):

<u>Country</u>	<u>Application No.</u>	<u>Filed</u>
IRELAND	S2001/0128	February 9, 2001

A certified copy of the above-noted application(s) is(are) attached hereto.

If necessary, the Commissioner is hereby authorized in this, concurrent, and future replies, to charge payment or credit any overpayment to Deposit Account No. 02-2448 for any additional fee required under 37 C.F.R. §§ 1.16 or 1.17; particularly, extension of time fees.

Respectfully submitted,

BIRCH, STEWART, KOLASCH & BIRCH, LLP

By James M. Slattery  
James M. Slattery, #28,380

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1817-0118P

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Attachment



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*1817-0118P*  
*10/071, 079*  
*2/11/02*  
*BskB, LLP*  
*(703) 205-8000*

Patents Office  
Government Buildings  
Hebron Road  
Kilkenny

I HEREBY CERTIFY that annexed hereto is a true copy of documents filed in connection with the following patent application:

Application No.	S2001/0128
Date of Filing	9 February 2001
Applicant	TECHNOLOGY INVESTMENTS LIMITED, an Irish Company of Gibbstown, Navan, County Meath, Ireland.

Dated this *23* day of January 2002.

An officer authorised by the  
Controller of Patents, Designs and Trademarks.

FORM NO. 1

## REQUEST FOR THE GRANT OF A PATENT

PATENTS ACT 1992

The Applicant(s) named herein hereby request(s)  
[ ] the grant of a patent under Part II of the Act  
[ X ] the grant of a short-term patent under Part III of the Act  
on the basis of the information furnished hereunder.

1. Applicant(s)

TECHNOLOGY INVESTMENTS LIMITED.  
Gibbstown.  
Navan  
County Meath  
Ireland  
an Irish Company

2. Title of Invention

A vehicle suspension system

3. Declaration of Priority on basis of previously filed application(s) for same invention (Sections 25 & 26)

<u>Previous Filing</u> <u>Date</u>	<u>Country in or for</u> <u>which filed</u>	<u>Filing No.</u>
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4. Identification of Inventor(s)

Name(s) and addresse(s) of person(s) believed  
by the Applicant(s) to be the inventor(s)

Ian Muldowney  
an Irish Citizen of 18 The Steeple, Navan, County Meath, Ireland  
Eanna Pronsiás Timoney  
an Irish Citizen of St Anthony's, Boyne Road, Navan, County Meath,  
Ireland

5. Statement of right to be granted a patent (Section 17(2) (b))

The Applicant derives the right to apply by virtue of a Deed of Assignment dated December 21, 2000

6. Items accompanying this Request

- (i) [ X ] prescribed filing fee (IRP 50)
- (ii) [ ] specification containing a description and claims
- [ X ] specification containing a description only
- [ X ] Drawings referred to in description or claims
- (iii) [ ] An abstract
- (iv) [ ] Copy of previous application(s) whose priority is claimed
- (v) [ ] Translation of previous application whose priority is claimed
- (vi) [ X ] Authorisation of Agent (this may be given at 8 below if this Request is signed by the Applicant(s))

7. Divisional Application(s)

The following information is applicable to the present application which is made under Section 24 -

Earlier Application No.

Filing Date:

8. Agent

The following is authorised to act as agent in all proceedings connected with the obtaining of a patent to which this request relates and in relation to any patent granted -

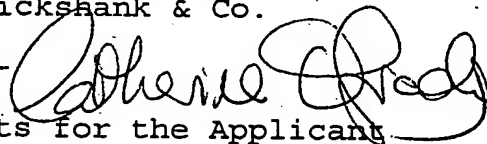
Name & Address

Cruickshank & Co. at their address recorded for the time being in the Register of Patent Agents is hereby appointed Agents and address for service, presently 1 Holles Street, Dublin 2.

9. Address for service (if different from that at 8)

Signed Cruickshank & Co.

By:-



Executive.

Agents for the Applicant

Date February 09, 2001.

"A vehicle suspension system"Introduction

- 5 This invention relates to suspension systems for vehicles, and particularly to independent suspension systems for vehicles.

10 Independent suspension systems for vehicles frequently employ two control arms, also referred to as "wishbones" or "A-arms", to locate a wheel carrier or hub with respect to the vehicle chassis and to allow movement of the wheel mounted on the hub in a generally vertical direction. A spring that can be virtually any type of spring, such as a coil spring or a pneumatic spring, opposes the upward movement of the wheel. The inboard end of each control arm is connected to the vehicle body by an articulating bearing or joint, while the outboard end of each control arm is connected in each case to the wheel carrier by a second articulating bearing arm joint so as to form a four bar linkage. Frequently, the spring is of an axial type such as a coil spring or a hydro-pneumatic strut, such that the spring deflection is along the same axis as the spring force, and has its upper end connected to the vehicle body while its lower end is connected to one of the two control arms. A disadvantage of the known independent suspension systems arises in that if the effective articulation axis of the lower end of the spring on the control arm to which it is connected is above the line joining the bearings connecting the control arm to the vehicle body and the wheel carrier, the top end of the spring may have to be connected to the vehicle body at an inconveniently high location. Also, because of the geometry, it may be necessary to locate the top of the spring inconveniently close to the vehicle centreline in order to obtain a useful effective spring characteristic referred to the wheel.

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The present invention is directed towards overcoming these problems.

30 Statements of Invention

According to the invention, there is provided a vehicle independent suspension system comprising an upper control arm and a lower control arm connecting with articulated joints at their inner ends to the vehicle body and at their outer ends to a wheel carrier,

a compression spring connecting at its upper end to the vehicle body with an articulated joint and at its lower end to either the upper control arm or the lower control arm with an articulating joint which has a centre of rotation below the line joining the points where said control arm articulates on the vehicle body and the wheel carrier respectively.

In another embodiment of the invention, the compression spring may be assisted by one or more additional springs.

In a further embodiment, the compression spring comprises one or more coil springs.

In another embodiment, the compression spring comprises a hydro-pneumatic spring.

In another embodiment, an additional compression spring is mounted between the vehicle body and a control arm.

Preferably, the additional spring is provided by a bump stop which is engagable with the control arm as the suspension travels in the direction of compressing the suspension spring.

#### Detailed Description of the Invention

The invention will be more clearly understood by the following description of some embodiments thereof, given by way of example only, with reference to the accompanying drawings, in which:-

Fig. 1 is an elevational view of a prior art suspension system, and

Fig. 2 is an elevational view of an independent suspension system according to the invention.

Referring to the drawings, and initially to Fig. 1 thereof, there is illustrated one side of a prior art double control arm independent suspension system 1, the other side of the system, which is located at an opposite side of the vehicle, being similar. The

suspension system 1 has an upper control arm 2 connecting to a vehicle body 12 at an articulating joint 5 and to a wheel carrier 13 at an articulating joint 6. A lower control arm 3 connects to the vehicle body 12 at an articulating joint 7 and to the wheel carrier 13 at an articulating joint 8. A coil spring 4 has one end connected to the vehicle body 12 at an articulating joint 9 and the other end of the spring 4 is connected to the lower control arm 3 at an articulating joint 10. It will be appreciated however, that the spring 4 could in fact be connected instead to the upper control arm 2.

Referring now to Fig. 2, there is shown an independent suspension system of the invention, indicated generally by the reference numeral 20. Parts similar to those described for the prior art suspension system shown in Fig. 1 are assigned the same reference numerals. It will be noted that a distinguishing feature of the present invention is that the articulation joint 10 between the spring 4 and the lower control arm 3 is below the line X joining the bearing or articulation joint centres 7 and 8.

Given the same spring and given that the distance between articulating points 7 and 10 are identical in both suspension systems of Fig. 1 and Fig. 2, the spring characteristic referred to the wheel will be identical in both cases because at each position of the suspension linkage, both the length of the spring 4 and the angle  $\alpha$  between the spring line of actions and the line joining points 7 and 10 are the same. However, it will be noted that the mounting joint 9 where the top of the spring 4 articulates on the vehicle body 12 is located at a lower level and further from the vehicle centreline in Fig. 2 than in Fig. 1. The construction of the invention permits a more favourable location of the top of the spring 4 because the spring centreline is rotated outward through the angle  $\beta_1 + \beta_2$ , where  $\beta_1$  is the angle between the line joining articulation points 7 and 10 and the line X joining points 7 and 8 in Fig. 2, and  $\beta_2$  is the corresponding angle in Fig. 1.

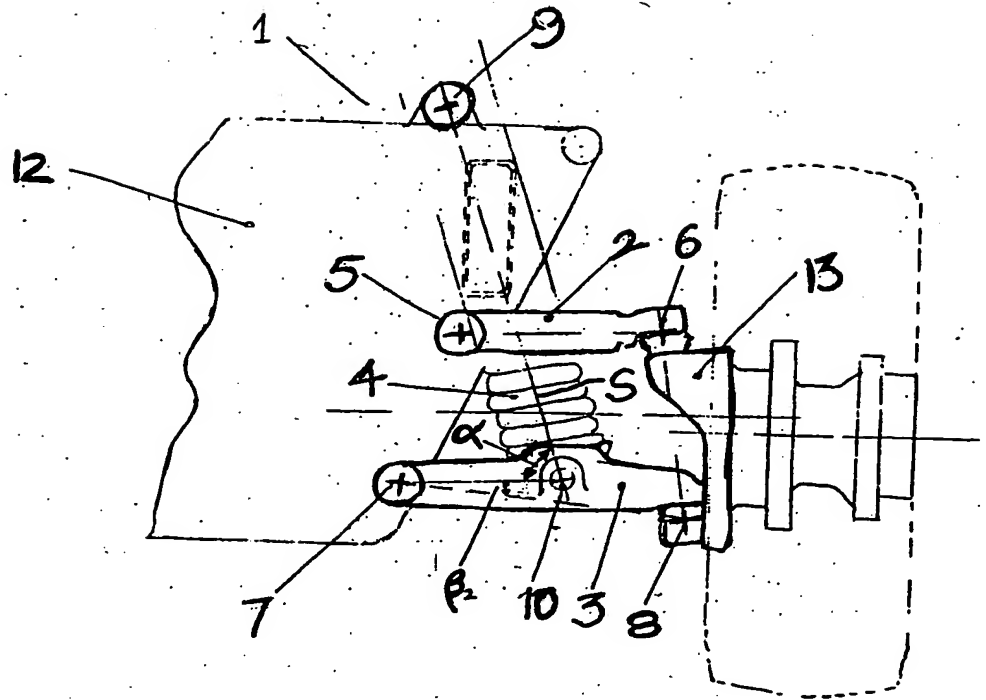
It is frequently desirable to have a progressively increasing effective suspension stiffness at the wheel as the suspension moves towards the bump position. In order to accomplish this with a linear spring characteristic, it is necessary that the angle  $\alpha$  increase towards  $90^\circ$  as the suspension approaches the bump position so that the spring force has maximum leverage on the control arm at this position. It will be appreciated that the invention makes it easier to achieve this while avoiding the

intrusion of the spring on useful space closer to the vehicle centreline.

The invention is not limited to the embodiments hereinbefore described which may be varied in both construction and detail.



1/1



PRIOR ART

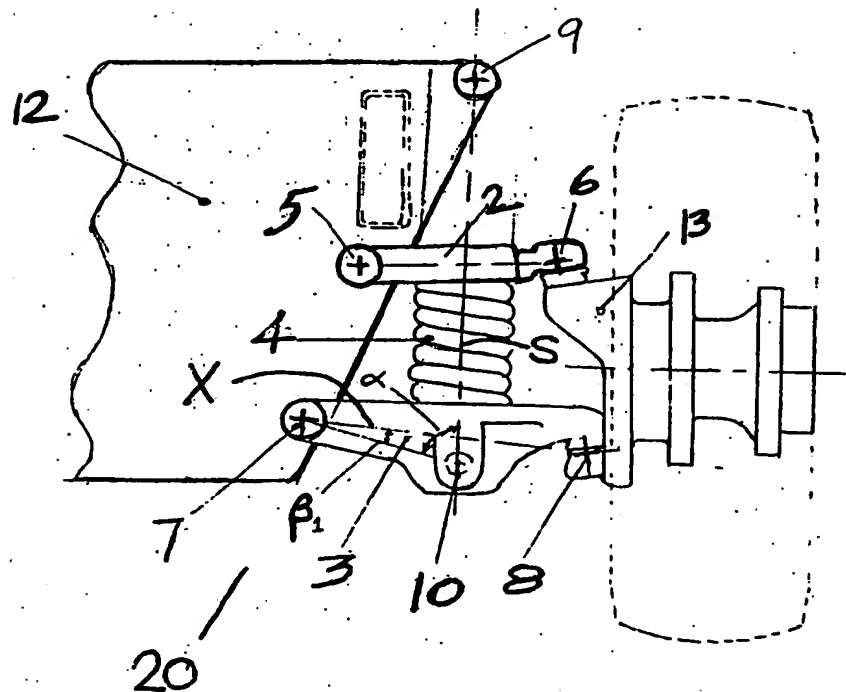


FIG 2